INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/000982

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: H02P 6/18, H02P 7/295, H02P 21/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI & esp@cenet IPC:H02K, H02P, H02M, H02J & keywords: MOTOR, CONTROL, CONVERTER, COIL, CAPACITOR, SERIES, SWITCH, TRANSISTOR, CURRENT, SENSE, AVERAGE, BRUSHLESS and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 59-025589 A (MATSUSHITA ELECTRIC IND CO LTD) 9 February 1984 See abstract from PAJ and figures 1 and 2 of the original document	1-7, 12, 14
X	US 4673851 A (DISSER) 16 Jun 1987 See whole document	1-7, 8-11, 12, 14, 38, 39
X	US 4473781 A (NIELSEN) 25 September 1984 See whole document	1-7, 12, 14

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 November 2004	19 NOV 2004
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer BAYER MITROVIC Telephone No : (02) 6283 2164

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US6008999 A (MARRERO) 28 December 1999 See whole document, especially column 1 lines 15-20 and figures 1, 3, 5 and 7	8-11, 12, 14, 38, 39
X	US 4472666 A (AKEDA ET AL) 18 September 1984 See whole document, especially Fig.1 and column 1 lines 10-35, column 3 line 25 – column 6 line 27.	8-11, 12, 14, 38, 39
X	EP 478808 B1 (SIEMENS AG) 8 April 1992 See abstract from esp@cenet and Fig.1 of the original document	8-11, 12, 14, 38, 39
X	JP 10-271883 A (FUJITSU GENERAL LTD) 9 October 1998 See abstract from PAJ	8-11, 12, 14, 38, 39
X	Derwent Abstract Accession No. 1999-536212/45, Class V06, JP 11-235087 A (NIPPON ELECTRIC IND CO LTD) 27 August 1999 See abstract and machine translation of the original document from PAJ	8-11, 12, 14, 38, 39
X	US 2002/0021100 A1 (BROWN) 21 February 2002 See whole document	23-34
X	EP 963034 A1 (HSIEH) 8 December 1999 See whole document, especially figures and column 3 lines 25-27, 52-58	23-34
X	WO 2000/033453 A1 (MTS SYSTEMS CORPORATION) 8 June 2000 See whole document, especially Fig.1, page 1 lines 5, 6, page 2 lines 6-34	23-34
X	EP 1271759 A2 (MINEBEA CO. LTD.) See Figs.1 and 2, abstract and column 4 paragraphs [0031] and [0032]	23-34
X	Derwent Abstract Accession No. 2001-131985/14, Class U24, JP 2000350462 A (SHARP KK) 15 December 2000 See abstract and figures of the original document	35-37
X	Derwent Abstract Accession No. 2001-384251/41, Class S01, JP 2000350448 A (OMRON KK) 15 December 2000 See abstract and figures of the original document.	35-37
X	Derwent Abstract Accession No. 96-169515/17, Class T01, JP 08051736 A (FUJITSU TEN LTD) 20 February 1996 See abstract and figures of the original document.	35-37

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C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent Abstract Accession No.96-294417/30, Class T01, JP 08-126312 A (MINEBEA KK) 17 May 1996 See abstract and figures of the original document.	35-37
X	Derwent Abstract Accession No.2000-597909/57, Class T01, JP 2000245150 A (SHARP KK) 8 September 2000 See abstract and figures of the original document.	35-37
X	US 5973942 A (NELSON ET AL) 26 October 1999 See whole document, especially abstract, Figs.2 and 3, column 3 line 17 –column 6 line 36	35-37
X	WO 2000/026740 A1 (VOLTERRA SEMICONDUCTOR CORPORATION) 11 May 2000 See whole document, especially abstract, page 1 lines 9-30, page 10 line 14 – page 15 line 6, page 20 line 21 – page 21 line 3 and Figs. 1-4	35-37
X	WO 2001/071895 A2 (THE PROCTER & GAMBLE COMPANY) 27 September 2001 See whole document, especially abstract, last paragraph on page 1 – last paragraph on page 2, page 8 and figures 1-5.	35-37
X	US 6218818 B1 (KIM) 17 April 2001 See whole document, especially column 1 line 5 – column 2 line 31 and figures 1 and 2	35-37
X	GB 2086156 A (HITACHI LTD) 6 May 1982 See abstract, Figures 1-2B and page 1 lines 3-65	35-37
X	US 6259613 B1 (LEE ET AL) 10 July 2001 See whole document, especially abstract and figures 1 and 2.	41-46
X	US 6178104 B1 (CHOI) 23 January 2001 See whole document, especially abstract and figures 1, 4 and 8	41-46
X	US 6175218 B1 (CHOI ET AL) 16 January 2001 See whole document, especially abstract and figures 1 and 3	41-46
X	US 6091233 A (HWANG ET AL) 18 July 2000 See whole document, especially abstract and figures 1-3	41-46
X	US 6043997 A (HE ET AL) 28 March 2000 See Fig. 5 and abstract	41-46

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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: III

The claims do not relate to one invention only (or to a group of inventions so linked as to form a single general inventive concept). In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to be "special technical features". These are features that potentially distinguish the claimed combination of features from the prior art. Where different claims have different special technical features they define different inventions. I have found claims having different special technical features as follows:

(1) Claims 1-7 are directed to a system for driving a direct current motor. It is considered that 1st switch coupled to an inductive element, 2nd switch controlled so that a current circulating through the inductive element circulates through the second switch if the 1st switch disconnects the terminal, a capacitor in parallel to the motor, an inductive element, means for measuring the current and a means for controlling the operation of switches comprises a first special technical feature.

(2) Claims 8 and 9-11, 38 and 39 when appended to claim 8 is directed to a system for driving a direct current motor. It is considered that an arrangement including plurality of switches, diodes and magnetic elements configured as a DC-DC converter, a capacitor in parallel to the motor, an inductive element, a means for measuring the current and a means for controlling the operation of said arrangement comprises a second special technical feature.

(3) Claims 12-22 and 40 when appended to claims 12-15 are directed to a system for driving a direct current motor. It is considered that a diode or synchronous rectification switch, a magnetic transformer, a switch coupled to magnetic transformer, a capacitor in parallel to the motor, a means for measuring the current and a means for controlling the operation of said arrangement comprises a third special technical feature.

(4) Claims 23-31 and 32-34 when appended to them are directed to an airflow apparatus. It is considered that a brushless DC motor, an electronic circuit for controlling its operation, a power supply and a means for reducing power comprises a fourth special technical feature.

(5) Claims 35-37 are directed to a system for powering a microprocessor based system. It is considered that a capacitor, a means to charge said capacitor, a switch coupled to capacitor a means for sensing voltage and a means for keeping switch closed comprises a fifth special technical feature.

(6) Claims 41-46 are directed to a switching based AC-to-DC converter. It is considered that a rectifier, a 1st capacitor, an inductive element, a 1st and 2nd switch, a 2nd capacitor, a means for sensing current through the inductive element, a means for sensing voltage across 1st capacitor, a means for sensing voltage across 2nd capacitor comprises a sixth special technical feature.

The feature common to all of the claims is at most a generic power-electronics and/or DC motor control circuit having generic switches, capacitors and inductors connected into a control/driver/filter network of an unspecified topology and functionally incompletely characterised. However this common feature is generic in the art of power electronics converters and DC motor controllers. Consequently the common feature does not constitute "a special technical feature" since it makes no contribution over the prior art. Since there exists no other common feature which can be considered as a special technical feature, no technical relationship between the different inventions can be seen and, therefore, the application is directed to more than one invention.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
JP	59025589	DE	3327761	JP	59025587	JP	59025590
		US	4527102				
US	4673851	EP	0240172	JP	62236382		
US	4473781	CA	1174727	DE	3003583	DK	33481
		FR	2475309	GB	2068664	JP	56121385
US	6008999						
US	4472666	JP	59056884	JP	59129595		
EP	0478808						
JP	10271883						
JP	11235087						
US	2002021100	CA	2406135	EP	1312155	WO	0217468
EP	0963034	US	6054824				
WO	00033453						
EP	1271759	CN	1407711	JP	2003003990	US	2002197068
		US	2004164692				
JP	2000350462						
JP	2000350448						
JP	08051736						
JP	08126312	JP	3483167				
JP	2000245150						
US	5973942						
WO	0026740	AU	13367/00	EP	1125178	US	6031361
		US	6100676	US	6198261	US	6268716
		US	6351108	US	2001038277	US	2004052098
WO	0171895	AU	45908/01	AU	49227/01	AU	58845/00
		CA	2377166	CA	2403619	CA	2403782
		EP	1190480	EP	1266442	EP	1269613
		MX	PA02009147	US	6304467	US	6310789
		US	6370046	US	6643151	US	6646415
		US	2001033501	WO	0101553	WO	0171893
US	6218818	CN	1316820	JP	2001292562	KR	2001094704

GB	2086156	CH	651441	DE	3134540	GB	2142489
		GB	2142490	HK	43486	HK	46886
		HK	70686	IN	154218	JP	57061981
		MY	36587	MY	36687	MY	57886
		US	4428040				
US	6259613						
US	6178104	JP	2000165210				
US	6175218	JP	2000139079				
US	6091233	US	6344980	US	6469914		
US	6043997						

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX